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AUTHOR Spillman, Carolyn V.; And Others
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ABSTRACT

A study evaluated the effects of one reading software program on the written language production of kindergarten and first grade students. Subjects were approximately 600 students from six different schools--three using the computerized reading program, Writing to Read, and three comparable in demographics, but not using the program. Stories written on the topics of the children's choice were gathered from all students during a two-week period. The writing samples were evaluated for (1) number of communication units, (2) mean number of words per communication unit, (3) and stages of spelling generalizations. Students in the Writing to Read program also had daily access to an IBM typewriter and daily language experience through writing activities. Control group students had no computers or typewriters and were infrequently exposed to language experience activities. Results of analyses showed that writing samples from the students using the computer program contained twice as many communication units as those of the control group. Additional differences favoring the computer group were found in all measures. (FL)

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Writing via Reading Software:

An Empirical Study

Carolyn V. Spillman, University of South Florida at Fort Myers

Gilbert R. Hutchcraft, University of South Florida at Fort Myers

Charleen Olliff, University of South Florida at Fort Myers

J. P. Lutz, Lee County School District

Angela Kray, University of South Florida at Fort Myers

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This study evaluated the effects of one reading software program on the written language production of kindergarten and first grade children.

A total of 569 kindergarten and first grade children composed the experimental and control groups. Writing samples were taken during a two week time period. Children were exposed to standard stimuli in groups of six and were asked to write a story on the topic of their choice. The measures of evaluation were number of communication units, mean number of words per communication unit, and stages of spelling generalizations. The experimental group participated in the Writing to Read program which provided a computerized beginning reading program, daily access to an IBM typewriter, and daily language-experience writing activities. The control group had no access to the computerized program or to the typewriters and were exposed to language-experience activities infrequently.

Analysis procedures of three-way ANOVA and chi square were used. Findings: Children in the experimental group produced writing samples with twice as many communication units as were found in control group samples. These differences were significant at the .0001 level. Significant differences favoring the experimental group were found in all measures.

The implications are that early, structured experiences with a computerized program, balanced with opportunities to talk, group write, and read increase the production of written language in young children.

Writing via Reading Software: An Empirical Study

No one questions the impact that computers are having on the field of education. As the printing press turned illiterate societies into reading and writing masses, the computer is having a similar revolutionizing effect upon education as leaders seek to find its maximum uses.

One use of the computer has been to teach initial reading and writing to children in kindergarten and first grade; consequently, an important question to educators is the effectiveness in competency acquisition of the use of computerized programs to teach literacy. The major focus of this study was to evaluate the effects of one such program on the writing of kindergarten and first grade children in three pilot schools.

Review of Research

A review of research suggested that children as young as three to five years of age are capable of using the computer (Brady & Hill, 1984; Swiggs & Campbell, 1981; Piestup, 1981). Since the use of computers in the classroom has been primarily for drill and practice, there was little consensus on its effectiveness in raising achievement levels (Edwards, Norton, Taylor, Weiss, & Dusseldorp, 1975). Results of pilot programs which have used computerized materials have been difficult to evaluate because of the lack of pertinent data (Martin, 1981; Asbell, 1984; ASCD Update, 1984; Martin, 1984).

Since the focus of this study was on the effects of the use of reading software on writing, the relationship between reading and writing processes was investigated. Wilson (1981) suggested that the two processes are mirror images of each other, while Bracewell, Frederiksen and Frederiksen (1982) described comprehension and composing as the two extremes of a continuum. The quality of comprehension in both reading and writing is dependent upon the prior knowledge the reader brings to reading or writing. To find meaning in reading, Macrorie stated that a child must read like a writer as Frank Smith has suggested that he must write like a reader (Miller, 1982). In writing, a child constructs meaning; in reading, he reconstructs the text in familiar terms. Both are generative processes (Wittrock, 1983). In several research studies, positive correlations between reading scores

and ratings of writing quality were found (Loban, 1963; Woodfin, 1968; Grimmer, 1970; Bippus, 1977).

C. Chomsky (1971) suggested that not only are reading and writing related, but that writing should precede reading. The child should be allowed the active role of composing, creating his own spellings for familiar words, and then move to reading what he and others have written. Chomsky concluded that children seem able to produce (write) before they are capable of processing (reading) what is written.

As children move from random letter formation to actual written representation of their ideas, they employ a variety of spelling strategies which appear to develop sequentially. Exploratory and observational studies have yielded uniform documentation of a systematic, sequential pattern of spelling development (Read, 1971; C. Chomsky, 1971; Beers & Henderson, 1977; Beers, Beers & Henderson, 1977; Gentry, 1978; 1981; revised, 1982; Henderson & Beers, 1980).

It is generally agreed by researchers (Wood, 1982; Bennett. 1981; Paul, 1976) that increasing audience awareness and acquisition of sight vocabulary, accompanied by extensive writing experiences, lead children to an easy transition to standard spelling.

It was the contention of these researchers that written production would be higher for children who began writing experiences with reading software than for children without those experiences. Written production was assessed by the number of communication units (C-units), mean words per C-unit, total number of words produced, total number of correctly spelled words, and placement on a sequential spelling development scale. The ranking on the spelling scale ranged from low (1) to high (5) and was based on Gentry's research (1982). The C-unit was defined as each independent clause and its modifiers (Loban, 1976).

METHOD

Subjects

Subjects for the study were from kindergarten and first grade classes in six Lee County, Florida schools. Three schools in which the computerized reading program (Writing to Read) was operational were designated as the experimental schools.

Matching control schools were so designated on the basis of comparable free or reduced lunch percentages, minority and migrant population percentages and history of scoring similarly on the California Achievement Test. Comparability data are given in Table 1.

INSERT TABLE 1

All kindergarten (K) and first grade (1st) children (N=303; K=110, 1st=193) in the three experimental schools who completed the ten cycles of the Writing to Read program by the final assessment date comprised the experimental group.

The control group (N=263; K=130, 1st=133) consisted of not less than 40 students randomly sampled from each kindergarten and first grade at each control school.

Design and Data Analysis

This study utilized a 2 X 2 X 2 factorial design in which performances were assessed as a function of two treatments at two grade level and by sex using an analysis of variance.

Materials/Apparatus

Elicitation of a written response by each S was accomplished with the use of a visual/auditory stimulus experienced by the S who was then asked to write a story.

The stimulus story was played on a cassette recorder as the child observed black and white overlays projected by an overhead projector. Guidelines for the standard procedure for obtaining the written response were given to each of the three experimenters.

Procedure

Before beginning data collection, a survey was administered to the teachers in the experimental schools and another was administered to all teachers in both experimental and control schools to assess programmatic variations. Two researchers interviewed all teachers.

To elicit a writing sample from each S, the following procedure was used by three experimenters and six primary education specialists (PSs):

Six to eight Ss were escorted by the PS to the designated testing area and were seated around a table. Ss were told that they would hear and see a story and would later write a story. Immediately following the presentation of the stimulus, paper and pencils were distributed.

To remain consistent with materials used in the classroom, kindergarten Ss were given unlined paper and primary lined paper was given to first grade Ss. The PS asked the Ss to write a story about any topic they wished. They were advised not to worry about spelling but to spell words as they sounded. After completing the composition, each S read his sample to an experimenter who recorded it on a cassette recorder.

DATA ANALYSIS

A three-way analysis of variance was used to analyze the interval data obtained from the written composition of each S. Analysis included:

a. number of C-units in each composition
b. mean words per C-unit
c. number of words produced
d. number of words spelled correctly

A chi square was used on the ordinal data which consisted of the ranking of spelling strategies.

Results

Subjects in the experimental schools performed significantly higher on each dependent variable than did Ss in the control schools. They produced more C-units and had a higher mean number of words per C-unit. They produced a larger total number of words and spelled more words correctly. See Table 2.

INSERT TABLE 2

These results were consistent across grade levels and total population. With the exception of mean words per C-unit in the first grade, all results were at the .0001 level of significance.

There were significantly more Ss in the experimental schools who scored in the higher spelling stages than in the control schools. In both kindergarten and first grade, Ss in the experimental schools scored

significantly more often in the higher stages than did Ss in the control schools. See Table 3.

INSERT TABLE 3

Two two-way interactions were found. An interaction was found between sex and treatment on the number of correctly spelled words. A second two-way interaction between treatment and grade level was found on mean words per C-unit.

All other two-way interactions were found to be nonsignificant.

Three-way interactions between schools, sex and grade were found to be nonsignificant for all dependent variables.

The survey given only to experimental teachers reflected variations within the program and results are reported in ranges. The results of the questionnaire given to all teachers in the study are reported in percentages.

Discussion

The results clearly indicate that written production was enhanced in students who were exposed to reading software in this study in terms of C-unit production, mean number of words per C-unit, total number of words produced, total number of correctly spelled words, and spelling stages.

The interaction between sex and treatment on the number of correctly spelled words (graph 1) may be attibuted to developmental or societal influences. Girls tend to develop at a faster pace than boys at some age levels, so these differences could be developmental. Societal pressure may also affect the results through the degree of importance which is placed on writing and on correctly spelled words for each sex. Whatever underlying factors have influenced these results, it still remains that females in the experimental group spelled correctly signeficantly more than males in the same group. Whether or not females were influenced by other factors, it was demonstrated that they benefited more than males from exposure to the reading program.

The second interaction (graph 2) is indicated by the angle of progress by kindergarteners as opposed to first graders on mean words per C-unit. Kindergarten age is a volatile period for language growth

and apparently the reading software contributed to the language production of the experimental group. As other research has indicated, mean words per C-unit for speech at kindergarten age is 4.81 (Loban, 1963) while children at grade one speak 6.05 mean words per C-unit. In the speech mode there is a leveling out between ages six and seven in which growth is not as phenomenal as previously noted. This pattern may also be true for written production and may be related to the interaction shown in graph 1.

These data support the growth spurt via reading software for kindergarten children. Further research is needed to substantiate whether or not growth continues at that rate or tapers off in children of older ages.

The presence in the experimental program of factors favoring written production is clearly demonstrated in this research. A discussion of the factors involved must begin with the influence of the computer. To what extent did the computerization of the reading program affect these results? The computer was the motivator, drill master, response monitor, and diagnostician, freeing the teacher to guide the child toward meaningful writing.

Of factors which influenced the findings of this study, it is probable that one of the most suggestive sources of information is the compilation of interview data. One of the most noticeable differences in response was in the number of opportunities given children to write. While 100% of the experimental Kindergarten teachers reported that their children dictate, write, or both, 62% of the control Kindergarten teachers stated that their children never had those experiences. Additionally, 90% of the Kindergarten experimental teachers reported the frequency of these activities as more than twice a week. More experimental teachers than control teachers reported that they do not require correct spelling.

A logical conclusion regarding the statistical significance of the differences between the experimental and control groups is that the components for an effective reading-writing-spelling program are found with the computerized reading system. Although reading was previously

considered a prerequisite to writing, some authorities have recommended that writing should precede reading (Chomsky, 1971) while others have viewed reading and writing as related processes (Squires, 1983; Wittrock, 1983). More than a "related process" (Squires, 1983), this research suggests a symbiosis in which the two processes cojoined result in a product much greater than either process on its own. Ss who experienced the experimental program scored significantly higher (p .0001) than those in the control group on the reading portion of the California Achievement Test. In the area of spelling, the measure of total number of correctly spelled words yielded a statistically significant difference favoring experimental Ss.

Table 2

Experiences such as visual discrimination, letter-sound relationships, directionality and prediction which are practiced in the computerized reading program are also basic expectations in beginning reading. It is not surprising that children who interact with a computer which is programmed to instruct in those areas, then immediately dictate or write their own thoughts using those same skills, are the children who are better readers, writers and spellers. For those children, reading and writing are meaningful experiences.

The research findings of Beers & Henderson (1977), Gentry (1981; revised, 1982), and Read (1971) have documented the stages of natural development in spelling. The Ss in the experimental program were found to exhibit characteristics of the higher stages of spelling (p .0001).

One limitation of this study is a methodological concern. The recommended method for obtaining data for classification into spelling stages is by a word list given to children to spell. In this study, rankings were made on the characteristics found within the words in each child's story. A question remains concerning the impact of using words from story rather than a given word list.

In conclusion, these findings make a strong statement for the inclusion of print experiences in the curriculum of young children. The results add credence to the growing belief that writing and reading should be taught simultaneously.

Some implications of this study for kindergarten and 1st grade teachers are:

- Read to the children more than twice a day.
- Encourage writing and dictating daily even among children who say "I can't write."
- Encourage children to spell words as they sound and avoid an emphasis on correct spelling.
- Encourage children to risk writing even if others cannot read it.
- Use all available "gimmicks" such as computers and typewriters to initiate and maintain interest in written expression.

Table 1

Comparability data on control and experimental schools

	Experimental Schools (Writing to Read)						Control Schools (Non-Writing to Read)					
	School 4		School 5		School 6		School 1		School 2		School 3	
Free/ reduced lunch %	75		51		48		76		53		52	
Minority %	44		19		24		37		33		18	
Migrant %			18						9			
CAT 1st Gr Total EOY '81	1.8	5			1.7	5	1.8	5	1.7	5	1.6	5
CAT 1st Gr Total EOY '82	1.8 318	59 5			1.7 314	57 5	1.6 304	44 5	1.7 308	46 5	1.6 306	44 5
CAT 1st Gr Total EOY '83	1.9 324	67 6	1.7 311	50 5	1.8 318	59 5	1.7 308	46 5	1.6 305	42 5	1.7 309	47 5

Key:

Grade Equ. Nat'l %ile

Scaled Scores Nat'l Stanines

*Note: Schools 4 and 1, 5 and 2, and 6 and 3 were matched.

Table 2

INTERVAL LEVEL VARIABLES

VARIABLES		WTR MEAN	WTR S.D.	NWTR MEAN	NWTR S.D.	SIG. p
C-UNITS	TOTAL	3.00	2.39	1.31	1.89	.0001
	FIRST	3.81	2.38	2.30	2.18	.0001
	K	1.57	1.59	.29	.77	.0001
MEAN WORDS/ C-UNIT	TOTAL	5.41	3.19	3.15	3.61	.0001
	FIRST	6.22	3.04	5.25	3.36	.0069
	K	3.98	2.93	1.00	2.39	.0001
# CORRECTLY SPELLED WORDS	TOTAL	13.40	10.84	6.87	9.34	.0001
	FIRST	17.04	10.98	11.08	10.14	.0001
	K	7.00	6.97	1.47	3.93	.0001
TOTAL WORDS PRODUCED	TOTAL	19.37	13.84	10.17	11.53	.0001
	FIRST	24.62	13.27	16.07	11.84	.0001
	K	10.17	9.37	2.61	4.77	.0001
END OF YEAR CAT	FIRST	111.08	7.18	104.88	14.45	.0001

TABLE 3

SPELLING STAGES

LEVEL	SPELL. STAGE	NWTR FREQ.	NWTR %	WTR FREQ.	WTR %	
TOTAL	0	27	3.3	4	.7	CHI SQ. =
	1	71	12.5	14	2.5	98.94
	2	29	5.1	28	5.0	
	3	97	17.1	176	31.1	p .0001
	4	26	4.6	52	9.2	
	5	13	2.3	29	5.1	
FIRST	0	5	1.5	0	0.0	CHI SQ. =
	1	8	2.5	2	.6	27.62
	2	11	3.4	9	2.8	
	3	80	24.5	135	41.4	p .0006
	4	24	7.4	40	12.2	
	5	5	1.5	7	2.1	
K	0	22	9.2	4	1.7	CHI SQ. =
	1	63	26.3	12	5.0	70.93
	2	18	7.5	19	7.9	
	3	17	7.1	41	17.1	p .0001
	4	2	.8	12	5.0	
	5	8	3.3	22	9.2	

Table 3

THREE WAY ANALYSIS OF VARIANCE OF C-UNITS BY SEX, GRADE AND SCHOOL

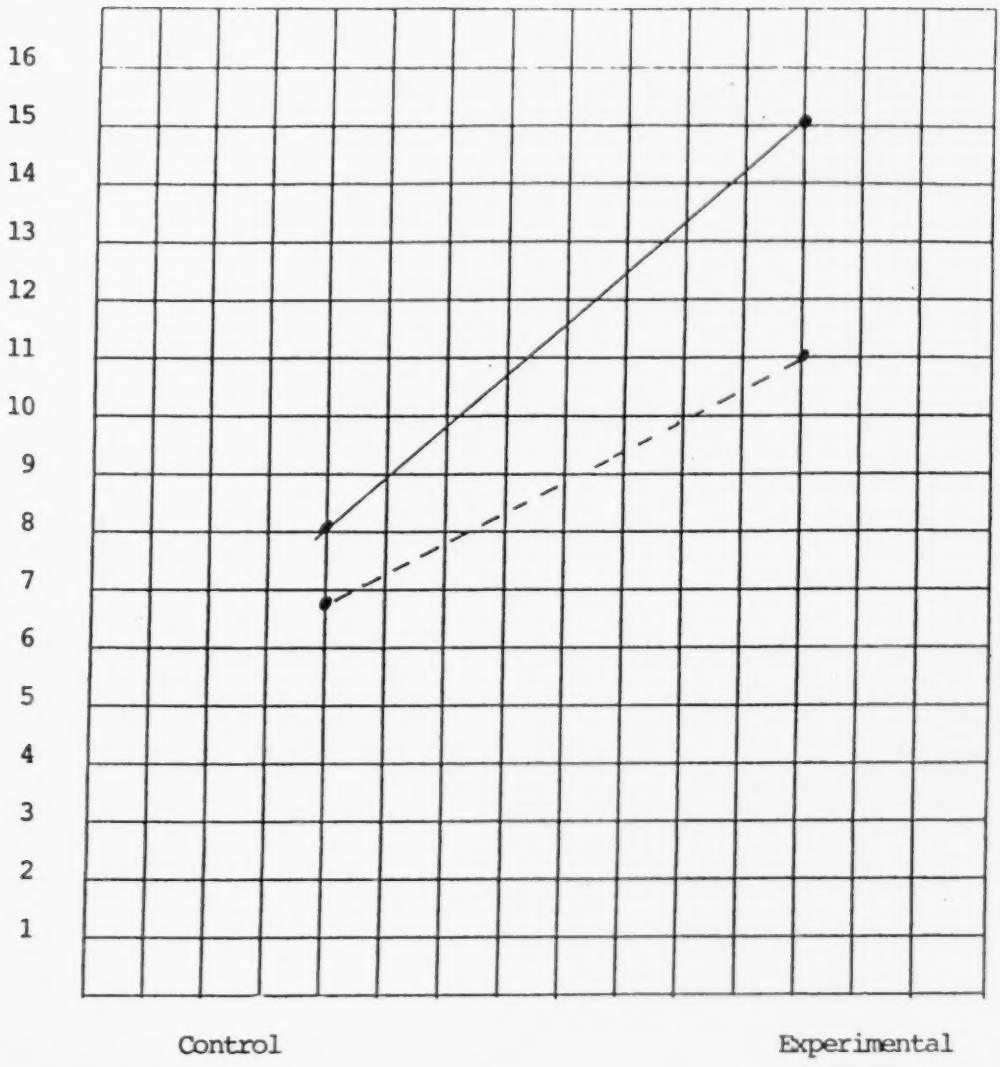
SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	p
MAIN EFFECTS	871.20	3	290.40	76.24	0.00
SEX	16.46	1	16.46	4.32	0.04
GRADE	577.73	1	577.73	151.67	0.00
SCHOOL	226.35	1	226.35	59.42	0.00
TWO-WAY INTERACTIONS	10.89	3	3.63	0.95	0.42
SEX-GRADE	2.68	1	2.68	0.68	0.40
SEX-SCHOOL	5.92	1	5.92	1.56	0.21
GRADE-SCHOOL	1.99	1	1.99	0.52	0.47
THREE-WAY INTERACTION	0.02	1	0.02	0.00	0.94
SEX BY GRADE BY SCHOOL	0.02	1	0.02	0.00	0.94
EXPLAINED	882.11	7	126.02	33.08	0.00
RESIDUAL	1950.26	512	3.81		
TOTAL	2832.37	519	5.46		

Chart 1

	Kindergarten		First Grade	
	WTR	NWTR	WTR	NWTR
	How often do you read a story to your students?			
once/day	50%	38%	27%	8%
once/day	50%	62%	64%	92%
once/day			9%	
	How often do your students write a creative story or dictate one to you?			
never		62%		15%
dictate	20%	30%		38%
write	40%		72%	46%
combination	40%	8%	27%	
2X/week	90%	15%	67%	31%
once/week	10%		27%	
2X/month		8%	9%	31%
once/month		15%		23%
	Do you use language experience stories in your classroom? If yes, how often?			
no	10%	31%	9%	23%
2X/week	30%	31%	9%	15%
once/week	40%	8%	36%	31%
2X/month	20%	8%	36%	15%
once/month		15%	9%	15%
	Do you require children to use correct spelling in their creative writing?			
NA		54%		23%
No	80%	15%	91%	62%
Yes	20%	15%		8%
Sometimes			9%	
	Do you supplement the Basal Reading Program? If yes, do you use:			
Alpha Time	80%	85%		
Listening Stations	90%	85%	91%	38%
Bridges to Reading	40%	31%		
Other	80%	15%	82%	77%

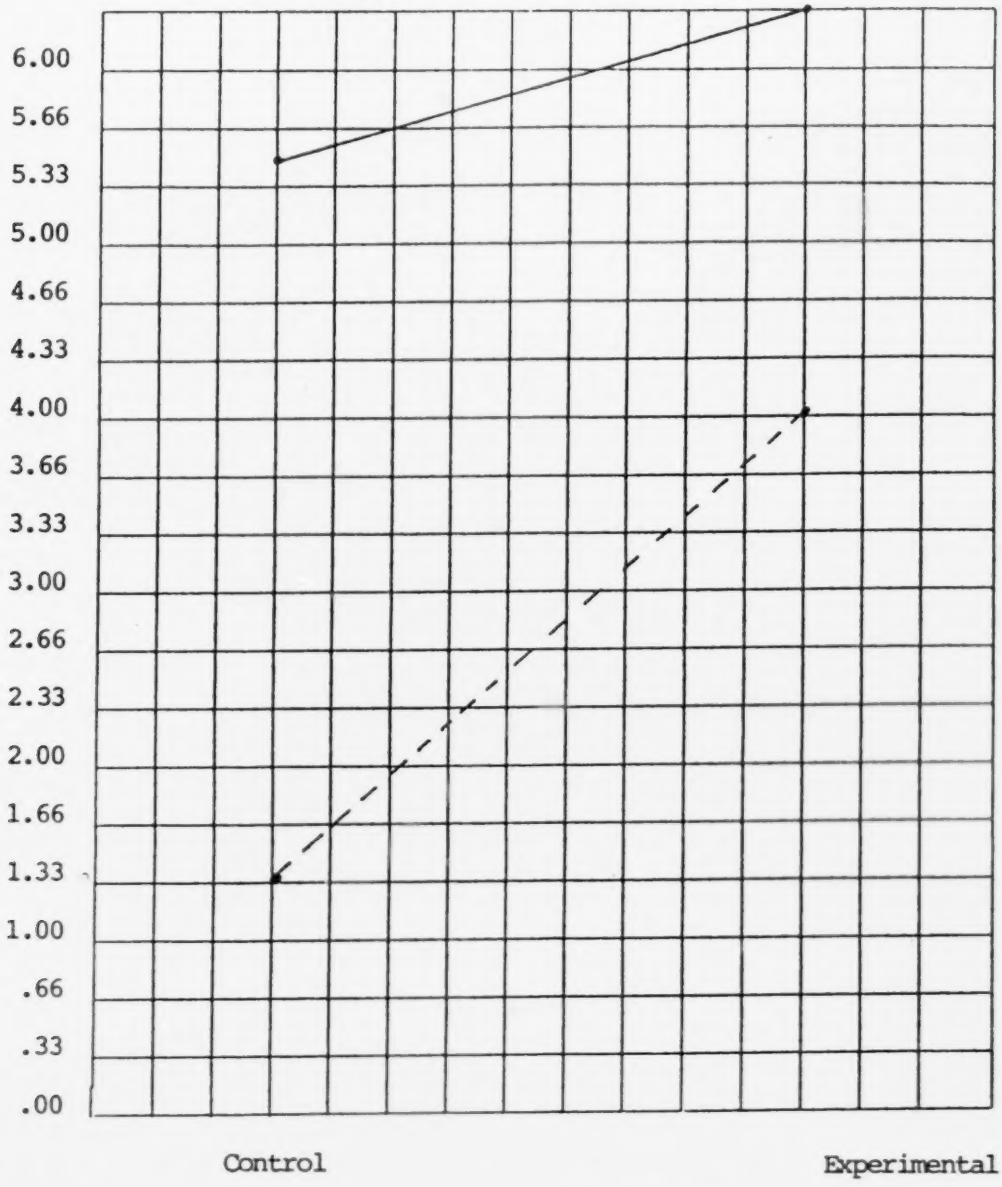
Graph 1

Sex by Treatment Interaction on Number of Correctly Spelled Words



Graph 2

Grade by Treatment Interaction on Mean Words per C-unit



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